

OWNER'S MANUAL

VOLKSMODEM 12

VERY
SMART
300/1200 BAUD
AUTO ANSWER
AUTO DIAL

MODEM

 ANCHOR AUTOMATION

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INTRODUCTION

Welcome to high-speed telecommunications! The Volksmodem 12 serves as the link between your computer or terminal and the world of information utilities, electronic bulletin boards, data bases, computer time-sharing, and more. The Volksmodem 12 is compatible with the Bell System 212A standard, which allows operation in full-duplex mode at either high speed (1200 bits-per-second) or low speed (0 to 300 bits-per-second.)

This modem is equipped with a five-pin DIN connector for use with the Volkscable™ interconnect cables, in order to simplify connecting to your computer or terminal. There is a Volkscable style available for almost any computer or terminal – see Volkscable Selection Guide, Appendix B. Volkscables are supplied with a 6' modular telephone cord.

Volksmodem 12 is also supplied with a 12 volt DC power adapter plugable into any 110/115 volt AC wall outlet.

The Volksmodem 12 is “smart” – it has a microprocessor and built-in firmware to allow you to carry out a wide variety of communications functions. Its features include automatic dialing and answering, tone and pulse dialing, dial tone detect, busy tone detect, and extremely low power consumption.

The Volksmodem 12 uses the standard Hayes Smartmodem™ command structure. It is therefore compatible with a wide variety of microcomputer communications programs.

Because the Volksmodem 12 is so adaptable and because there are so many possible installations and uses for it, we have placed our emphasis on describing its design, features, functions, and operational characteristics rather than specific applications. Our intention is to provide enough information for an experienced programmer to understand the general requirements for interfacing the Volksmodem 12 with the telephone system and almost any computer, terminal, or other RS-232C-compatible input/output device.

Please take the time to read these instructions carefully. They are written to guarantee that you get the maximum benefit from your Volksmodem 12 and that its use is in compliance with FCC and telephone company regulations. We hope it will provide you with many years of excellent service.

Smartmodem is a registered trademark of Hayes Microcomputer Products, Inc.

SECTION ONE: INSTALLATION

Notifying your telephone company

The Federal Communications Commission (FCC) has established rules governing how modems may be connected to the telephone system. Before connecting your modem you must tell your local telephone company that you intend to connect an FCC registered modem to your telephone line. They'll ask you for the following information:

1. Your telephone number.
2. The modem's FCC Registration Number and Ringer Equivalence Number (both located on the underside of the modem.)
3. The USOC telephone jack needed for connection: RJ11. (If your home is equipped with the older 4 prong telephone jacks, you must buy a RJ11-to-4 prong adapter from your local computer dealer, electronics dealer, telephone store, or hardware store.)

FCC rules also require you to notify your local telephone company before permanently disconnecting your modem. The telephone company may make changes in its service and operations from time to time. If these changes will affect the operation of your modem, they'll notify you before doing so.

Three things you can't do

FCC rules prohibit using your modem in the following ways:

1. The modem can't be connected to a telephone which is part of a party line (a telephone line shared by two or more subscribers.)
2. The modem can't be connected to a coin-operated telephone.
3. The modem can't replace your telephone. There must be at least one telephone connected to your telephone line.

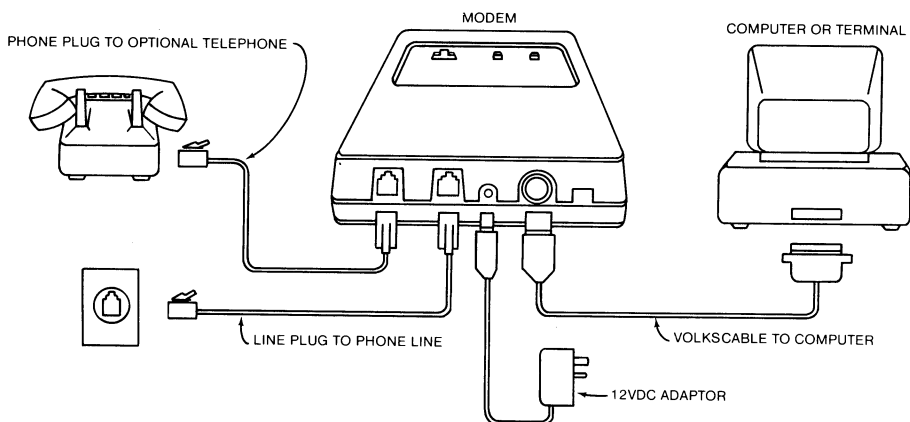
What you'll need

1. Volksmodem 12 with supplied 12 volt DC power adapter.
2. The proper Volkscable™ interconnect cable for your computer or terminal, plus the 6' modular telephone cord supplied with the Volkscable. If you aren't sure which cable you need, refer to the Volkscable Selection Guide, Appendix B.

3. A computer with monitor, a video display terminal, or other RS-232C compatible input/output device wired to receive and transmit serial data signals.

Standard Installation

The illustration below shows how a standard installation should look. The telephone is optional; you'll need it only for manual dialing and answering.



(Figure 1)

1. **Connect the modem to the telephone line.** Plug one end of the modular telephone cable into the LINE jack at the rear of the modem, and the other end into your wall outlet.
2. **Connect a telephone to the modem.** This is optional. The Volksmodem can be used without a telephone; however, if you'd like to use the same phone line for both data and voice communications, plug the modular phone cable coming from the rear of your telephone into the PHONE jack at the rear of the modem.
3. **Connect the modem to your computer or terminal.** Plug the proper Volkscable into the mating connector at the rear of the modem, then plug the other end of the cable into RS-232C communications port on your computer or terminal.

If your computer has more than one data communications port available and you're not sure which one to use, refer to the operating instructions for your computer or communications software. The modem must be connected to the port being addressed by both your hardware and software.

4. **Connect the power supply.** Plug the supplied 12 volt DC power adapter into a 110-115 volt AC wall outlet, then plug its cable into the DC PWR jack on the back of the modem. **Caution: To avoid damaging the modem, use only the power adapter supplied by Anchor Automation.**

Checking the installation

1. If you have a telephone connected to the modem, check to see if it's working properly. If you don't hear a dial tone, make sure the telephone cable is securely plugged into the PHONE jack on the modem.
2. Set the POWER switch on the modem to ON. The modem HS (High Speed) Indicator Light should light. If it doesn't, check the connections between the modem, power supply, and wall outlet.
3. Some computers have more than one port which can be used for data communications. Refer to the operations manual for your computer or communications software to determine which port to use. Make sure the modem is connected to the specified port.
4. With both your terminal (or computer) and modem switched on, type **AT** at the keyboard, then press the RETURN or ENTER key. **Note:** if using a computer, some type of communications software must be in place for this process to take place. If the modem is working correctly, you will see the word "OK" on your screen. If you don't see an "OK," make sure the screen's brightness control is properly adjusted. If no "OK" appears, consult your dealer to see if the unit should be returned for repair. If so, refer to the service instructions in Appendix A.
5. If you have problems with the telephone line after installation, disconnect the modem. If it's responsible for the problem, don't use it until it's been repaired by Anchor Automation. The telephone company isn't responsible for disturbances caused by non-telephone equipment.

FCC Notice

The Federal Communications Commission has established technical standards regarding radiation or radio frequency energy emitted by computing devices. The Volksmodem 12 falls under rules for a Class B computing device and the following information is supplied in accordance with 47 CFR 15.838.

This equipment generates and uses radio frequency energy, and if not installed and used in strict accordance with the installation and operating instructions contained in this manual, may cause interference with radio and television reception.

The Volksmodem 12 has been type-tested and found to comply with the limits for a Class B computing device in accordance with the specifications of Subpart J of Part 15 FCC Rules, which are designed to provide reasonable protection against radio and television interference in a residential installation. However, there is no guarantee that interference will not occur in your particular installation. If this modem does cause interference with radio or television reception, which you can check by simply turning the modem on and off, you are encouraged to try one or more of these corrective measures:

- Reorient the receiving antenna.
- Move the modem away from the receiver.
- Plug your computer system into a different outlet, so that the receiver is on a different branch circuit.

If necessary, consult the dealer who sold you this modem or an experienced radio/television technician for additional suggestions. You might also find a booklet prepared by the FCC helpful. Entitled "How to Identify and Resolve Radio and TV Interference Problems," it's available from:

U.S. Government Printing Office
Washington, D.C. 20402
(Stock Number 004-000-00345-4)

SECTION TWO: DATA COMMUNICATIONS BASICS

This section will give you basic information on the terminology used in data communications. If you already have a good understanding of data communications, you can skip to the next section on the Volksmodem 12 operating characteristics.

What a modem does

A modem is a device that allows you to use ordinary telephone lines to exchange data between computers and terminals. For a data communications link (computer-to-computer or computer-to-terminal) to function there must be a modem at both ends of the phone line.

Within a computer or terminal, data is represented by digital voltages (high vs. low). The telephone system accepts only sound, and because there are only two signal wires (one in, one out) signals must move serially, one after the other.

The modem itself converts the computer's digital voltages into tone signals and outputs them over the phone lines. It also converts incoming tone signals from a remote modem back to digital form. These processes are known as "MODulation - DEModulation", hence the name MODEM.

Half-duplex vs. Full-duplex

Communications lines or data links are typically classified by the direction and manner in which data can be moved. The most basic type of connection is *simplex*. Radio and television are examples of simplex communication. Data moves in only one direction. This method is impractical for transmitting and receiving data.

Half-duplex allows alternating communications using a single channel. CB radio is an example of half-duplex operation. Because users must take turns transmitting and receiving, this method has the disadvantage of being slow.

Full-duplex allows simultaneous communications by using two channels; one to transmit and one to receive. Normal telephone conversation is an example of full-duplex communications. This is

the fastest and most efficient means of exchanging data. The Volksmodem 12 is a full-duplex modem; however, through its internal firmware instructions, it can also simulate half-duplex operation.

The half duplex feature enabled by command F0 only operates at 1200 bps and not at 0 to 300 bps.

Local echo vs. Echo-plex

The terms half-duplex and full-duplex are also (confusingly) used to describe whether a computer or terminal displays outgoing characters directly onto its screen or whether the characters are “echoed” back from the remote system.

A computer or terminal operating in half-duplex (also known as *local echo*) displays its own characters on the screen as they are transmitted. A computer or terminal operating in full-duplex (also known as *echo-plex*) expects to have outgoing characters echoed back from the remote system. The computer, in turn, echoes back the characters it receives from the remote system. Of course, in order for this to happen, the remote system must also be operating in full-duplex/echo-plex.

The advantage of full-duplex/echo-plex is that it allows you to monitor the quality of the transmission. A character that’s being garbled by the telephone lines appears distorted on the screen and a character lost in transmission doesn’t appear at all.

If the remote system isn’t operating in full-duplex/echo-plex, the Volksmodem 12 can be commanded to enter its half-duplex/local-echo mode. In this mode the Volksmodem itself echoes characters to your screen. You’ll see what you’re transmitting, but you’ll have no way to be sure it was properly received.

The “trick” in data communications is to match the duplex and echo mode settings of your system to those of the remote system. If these settings are improperly matched, you will either see two characters for every character you transmit (both the local system and remote system are echoing characters) or no characters at all (neither system is echoing characters).

If you see two characters for every character you transmit, either the Volksmodem or your software is in local echo and should be set to echo-plex. If characters you type at your keyboard don’t appear on your screen, your system is in echo-plex but the remote system isn’t. You must therefore set either the Volksmodem or your software to local echo.

SECTION THREE: OPERATING CHARACTERISTICS

Command state vs. On-line state

The Volksmodem 12 has two distinct operating states: the *command state* and the *on-line state*. When in use, it's in one state or the other. When first switched on, the modem is in the command state.

The command state is used to control key Volksmodem functions, such as dialing a telephone number, answering the telephone, result codes, and switching from full-duplex to half-duplex. Commands consist of a specific set of character codes. While in the command state, the modem awaits your entry of a command, stores keyboard entries in its 34 character buffer, executes commands upon entry of a carriage return, answers with a result code, and waits for the next command. You must use the command state to enter the on-line state.

The on-line state, as the name implies, is the state the modem is in when it has established a communications link with a remote modem. You can receive data from the remote system and send data from your computer or terminal. Once on-line, you must return to the command state if you wish to execute additional commands. Also note that the Volksmodem will automatically return to the command state upon loss of the carrier or if the remote modem doesn't answer.

Answer Mode vs. Originate Mode

The on-line state has two sub-modes: answer and originate. A data communications link requires that one modem transmit and receive in the *originate mode* and the other receive and transmit in the *answer mode*. When you dial a remote system, the Volksmodem automatically switches to the originate mode. Conversely, when it answers an incoming call from a remote system, it automatically switches to the answer mode.

Transmission Speed

Commands given to the modem in the command state must be ASCII coded at rates of 300 or 1200 bps only. When on-line at 0-300 bps, any code may be used. When on-line at 1200 bps, any code may be used provided it has one start bit, eight information bits, and at least one stop bit (10 character format). Also, high speed transmissions from your computer or terminal to the modem must not vary beyond the limits of -2.5% to +1% from 1200 bps.

When the modem originates a call, it automatically adjusts to the transmission speed set on your computer or terminal. There is no modem command for changing the transmission speed. The speed set on your computer or terminal must therefore match that of the remote system. Commands and result codes will also be sent at the same speed as the remote system.

When the modem answers a call, it automatically adjusts to the transmission speed of the remote modem. The modem will output result codes to your system at the speed used in the last answered connection, or at the speed used in the last **AT** command sent to the modem from your system, whichever came last. All subsequent data and result codes must be sent by your system to the modem at the speed established by the new connection.

The result code **CONNECT 1200** indicates that the new connection is at 1200 bps. **CONNECT** indicates a low speed connection. The modem differentiates between low speed and high speed based upon the incoming carrier signal; however, it's incapable of determining the exact speed when a low speed connection is made.

High Speed vs. Low Speed Operation

The Volksmodem 12 houses two different modem types which use significantly different communication techniques. One major difference, inherent in all Bell 212A-type modems, is in the nature of communication errors. The data recovery techniques required for high speed operation unavoidably increase the probability of error due to distortion and noise from the telephone lines.

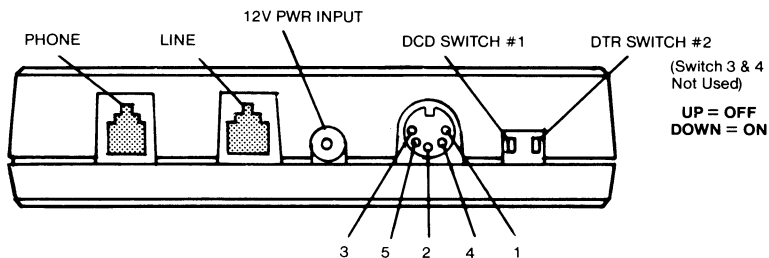
At low speed, a single bit error causes a single character to be interpreted as either incorrect or missing. A similar error at high speed is multiplied, usually causing two or more incorrect characters, one of which is always a printable ASCII character. These errors often produce a characteristic left brace ([]) or lower case "i." This is inherent in all high speed communications and shouldn't be interpreted as a hardware defect.

Signal Interfacing

Volksmodem cables are available for a variety of RS-232C-compatible computers and terminals, eliminating the need for

wiring custom cables. However, if you wish to connect the Volksmodem 12 to equipment for which no Volksmodem cable is available, you may design a custom cable, provided both the physical and electronic connections are compatible. The minimum signals are required to operate the modem are GND, TXD, and RXD. If you aren't certain how your equipment is wired, check the equipment manual, or contact your dealer or the manufacturer.

Connector Pin Assignments



(Figure 2 – Illustration of pin locations)

Pin	Signal	Circuit (RS-232C)	Description	Source
1	TXD	BA	Transmit Data - serial bit stream sent from DTE (computer or terminal) to modem (DCE).	Computer
2	GND	AB	Ground - reference level for all data signals	
3	RXD	BB	Receive Data - serial bit stream sent from modem (DCE) to computer or terminal (DTE).	Modem
4	DCD	CF	Data Carrier Detect - high level indicates data carrier signal has been detected from remote modem.	Modem
5	DSR/DTR		Data Set Ready (output) - Modem high level indicates modem is ready to operate. Data Terminal Ready (input) - high level enables modem to go on-line.	

RS-232C Option Switches

The Volksmodem 12 has two switches located on the rear panel which control the DCD and DTR functions on the connector. These switches allow the modem to interface with the wide variety of available terminals, computers, and programs. When shipped from the factory, both switches are in the default (UP) position.

Switch Position Function

DCD **Down** When the modem is on-line, it enables the computer connected to the Volksmodem 12 to determine if a carrier signal is being detected from a remote modem by reading the state of the RS-232 Carrier Detect lead (pin 4).

Up Forces the computer to accept locally echoed
(Default) characters and result codes from the Volksmodem 12. The RS-232 Carrier Detect lead (pin 4) will be in the TRUE condition at all times, even if the modem is not on-line and no carrier signal has been detected.

DTR **Down** Use this setting if your computer and software supports the RS-232 DTR lead (pin 5). The Volksmodem 12 will be disabled from seizing the telephone line when the state of the DTR output is FALSE. Making this lead FALSE forces the modem to hang up or not answer at all.

Up Use this setting if your computer and software
(Default) do not support the RS-232 DTR lead (pin 5). This causes the modem to ignore the state of DTR.

<p>SWITCH OFF – SWITCH LEVER IS IN UP POSITION SWITCH ON – SWITCH LEVER IS IN DOWN POSITION</p>

Power-on defaults

Defaults are operational settings used in the absence of instructions to the contrary. Whenever the Volksmodem 12 is switched on, or if a software reset command given, it will have the following operating defaults: the transmission speed will be 1200 bps, the modem will be operating in full-duplex, it will be on-hook (ready for incoming calls), and will automatically answer the phone at the first ring.

Indicator Lights

The two red Indicator Lights on the modem's top panel function as follows:

- HS Indicator - Indicates that the modem is operating in the high speed mode. It lights when the modem is first switched on. If the HS Indicator Light is off, either the modem is off or it's operating in the low speed mode.
- CD Indicator - The Carrier Detect Indicator indicates that the modem has detected a carrier signal from a distant modem. At this point the modem switches to its on-line state.

SECTION FOUR: COMMAND STRUCTURE AND RESULT CODES

The Volksmodem 12 is controlled by an internal set of firmware commands coded as ASCII character strings. Upon completing a command or set of commands, the modem will respond with a result code which is also in ASCII format. You will therefore need either a computer or a terminal capable of sending and receiving ASCII characters to and from the modem.

If you're using the Volksmodem with one of the more popular micro-computers (IBM PC, Apple II, Kaypro, etc.) you have the option of using one of the many commercial communications programs available for them. These programs offer conveniences such as text editors, text storage buffers, and file transfer protocols.

You can also operate the modem using a computer or terminal in the "dumb terminal mode;" i.e., each keystroke simply sends the corresponding ASCII character to the modem and each incoming ASCII character (message or result code) is displayed on the screen.

If you have any problems during operation, refer to the Troubleshooting Guide in Appendix A. It provides solutions for the most often encountered problems.

Master Command Set

The following group of instructions, although commands in themselves, are used to begin, end, repeat, and edit all other commands. Operational commands, dial commands, and set register commands

are in turn used to cause the modem to execute specific actions.

AT Attention code (Command prefix)

All command lines must begin with **AT** except where the **A/** or **+++** commands are used. The modem also determines the transmission speed and parity from this instruction.

<RETURN> Executes command (Command suffix)

The **<RETURN>** or **<ENTER>** key is used at the end of all command lines to instruct the modem to execute the command.

A/ Repeat previous command

This causes a repeat of the previous command. **A/** is entered in place of **AT** with no **<RETURN>** command needed. It's generally used to redial a telephone number after encountering a busy signal.

<BACKSPACE> Edit

The **<BACKSPACE>** key allows simple editing by deleting the last character typed. It does not delete an **AT** at beginning of a command line.

Command Syntax

Modem instructions must be structured using the following command syntax:

Attention Code/Command Letter/Parameter Number/<RETURN>

For example, the command **AT** (Attention Code) **F** (Command Letter) **0** (Parameter Number) **<RETURN>** would instruct the modem to switch to half-duplex operation.

Set register commands use a slightly different syntax:

Attention Code/Set Register Number = n <RETURN>

where "n" is the number value assigned to the set register. You must use the "=" sign; however, spaces before and after it are unnecessary.

You may combine commands to form a *command string*. For example, the command string **AT F0 DT555-1212; <RETURN>** instructs the modem to switch to half-duplex (**F0**), tone dial a number (**DT**) and return to the command state after dialing (;). All characters including the carriage return are stored in the Volks-modem's command buffer. The buffer stores a maximum of 34 characters, such as numbers, spaces and punctuation. The carriage

return at the end instructs the modem to execute the command.

The command string remains in the buffer after being executed. This allows you to repeat the string by simply entering a repeat command: **A/**. To clear the buffer, you may enter **AT**, reset the modem (command **AT Z**), or switch the power off and back on.

Modem instruction guidelines

The full set of Volksmodem 12 commands are listed and defined in Tables 1, 2 and 3. Result codes are listed and defined in Table 4. Where applicable, we've also provided the default value for each command. These values determine how the modem functions upon being switched on, after a software reset command (**AT Z**), or if no value or qualifier is specified for a particular command.

A command without a value defaults to zero. Commands can be in either upper or lower case characters but **must** be in ASCII serial format with 8 data bits.

You may insert spaces and specific punctuation marks for display clarity. Although they will be ignored by the modem's command processor, they do occupy space in the command buffer. A single command line cannot exceed a combination of 34 characters and spaces.

The commands have been grouped according to the functions they perform.

Operational Commands control the general operating functions of the modem. They are sent to the modem from the terminal or computer. These commands are listed in Table 1.

Dial Commands allow you to dial telephone numbers automatically, using either your keyboard or under program control. A telephone, automatic calling unit, or other device is unnecessary. However, if you wish to use your telephone to dial manually, you may do so. Table 2 lists and defines each of the Dial Commands.

Register Commands control the values stored in the Volksmodem's six Set Registers. These registers are memory locations which store user-assignable values for ASCII character codes and for when the modem will answer a call. Register commands are listed and described in Table 3.

Result Codes are the modem's response to your commands. Result codes may be in the form of words (ASCII characters) or digits, as selected by command **V**. Result codes are listed and described in Table 4.

TABLE 1 OPERATIONAL COMMANDS

+++ Escape On-line State

Causes an escape from the on-line state to the command state. The modem will stop data transmission and send the result code **OK**, but will not release the line unless commanded to hang up, or if the carrier signal is lost.

You must allow at least a one second guard time both before *and* after this command, during which time there can be no output of text to your screen. This guard time allows you to separate plus signs that are part of your data from an intentional escape command. The time is measured from the time the last character is transmitted to the time the first character of the escape code is entered.

Note that if you are in the answer mode or have the modem set for auto-answer, a +++ from the remote system *will* cause an escape from the on-Line state. If the remote system uses +++ as its escape code, you may wish to change your escape code by changing the value stored in register S2. (See Table 3).

O Return to On-Line State

Causes modem to return on-line state from the command state. Normally used after escaping to command state from on-line state.

A Answer phone without waiting for ring

Causes the modem to seize the line and go to the On-Line State in the Answer Mode. This command is typically used to switch a call from voice communication to data communication. The user at one end enters the **A** command while the other enters the **D** command to establish computer-to-computer communication.

Note that this command is intended for switching calls in progress, not for unattended auto-answer. Also, although the Volksmodem will execute any commands preceding the **A** command, it won't execute commands following the **A**.

C0 Carrier off (default)

C1 Carrier on

C0, the default value, turns the modem transmitter carrier off. **C1** turns the carrier on. The modem transmitter carrier is normally switched on or off automatically when the modem calls, answers, or is connected to a remote modem. **C1** and **C0** turn the carrier on and off without any other action occurring, thereby allowing manual control of the carrier.

E1 Command echo on (default)

E0 Command echo off

E1, the default value, echoes operator commands back to your screen. **E0** suppresses the echo of commands to your screen.

F1 Full-duplex (default)

F0 Half-duplex

F1, the default value is used when communicating with a remote system operating in full duplex/echo-plex; that is, a system that echoes transmitted characters back to your screen. Use command **F0**, half-duplex/local echo, if the remote system doesn't echo characters.

If characters appear doubled on your screen, both your modem and the remote system are echoing characters. You would then use command **F1** to switch the Volksmodem 12 to full-duplex/echo-plex. If characters you type at your keyboard don't appear on your screen, neither your modem nor the remote system are echoing the characters. You must therefore use command **F0** to switch the Volksmodem 12 to half-duplex/local echo.

H0 Telephone on-hook (default)

H1 Telephone off-hook

H0, the default value, is the state the modem is normally in when not in use, as if the telephone handset is resting in its cradle. It's used to manually disconnect the modem from a call. **H1** is used in special applications (such as amateur radio) to make the line "busy," as if the handset is off-hook and the telephone is in use. Note that the Volksmodem 12 is unable to automatically adjust transmission speeds when in this mode.

I0 Interrogate the modem

I1 ROM Test

This command is used solely by Anchor Automation for servicing the Volksmodem 12. **I0** causes a 3-digit result code to appear on-screen. The left two digits represent Anchor Automation's product code for the modem. The digit on the right is the modem's revision

level. **I1** causes a 3-digit result code derived from a cyclic redundancy check (CRC) of the ROM.

Q0 Send result codes to screen (default)

Q1 Do not send result codes to screen

Q0, the default value, causes result codes to be sent to the screen upon completion of a command. **Q1** suppresses all result codes. An example of its use is if you're using the modem with a receive-only printer and wish to eliminate result codes from the printout of transmitted data.

V1 — Send result codes as words (default)

V0 — Send result codes as digits

V1, the default value, send result codes to the screen as words. **V0** would be used only if your software can't easily handle text strings.

Z Software reset

This command forces all command parameters and set registers to their default state.

TABLE 2 DIAL COMMANDS

Note: When entering a dial command, the following characters occupy buffer space but are ignored by the command processor.

Character	Description
()	Open and close parenthesis
—	Dash
R	Upper case R
	Letterspace

D Dial a number

D places the modem in the originate mode and dials the specified number string, x. The number string may include other dial commands. If a telephone number isn't specified, the modem will go on-line in the originate mode.

P Pulse dial

P is used in combination with **D** to cause the modem to pulse dial the digits following the command. This command can also be used in combination with the **T** command to change from one dialing type to another during the dialing operation. For example, the first

three digits of the number can be pulse dialed and the remaining digits tone dialed: **AT DP213 T5551212**).

T Tone dial

T is used in combination with **D** to cause the modem to tone dial the digits following the command. It can also be used in combination with the **P** command.

If neither pulse nor tone dialing is specified, the modem will default to the last specified form of dialing. After being switched on or after a reset (**AT Z**) command, the modem defaults to pulse dialing.

, Two second pause

Inserting a comma into the telephone number causes the modem to pause for two seconds. Consecutive commas may be used for longer pauses. Commas are normally used when the modem must wait for a new dial tone after dialing the digit for an outside line.

; Return to command state after dialing

A semi-colon may be used at the end of a telephone number to cause the modem to return to the command state after dialing. You will be connected with the remote modem but will not be on-line.

TABLE 3 SET REGISTER COMMANDS

S0 Answer on ring number

This register controls the number of times the telephone will ring before the modem automatically answers the call. The number of rings can be any number from 0 to 255. A value of 0 disables the automatic answer function. The default value is 001, which causes the modem to answer the phone upon the first ring. **S0** returns to the default value when the modem is switched on or after a software reset command (**AT Z**).

S1 Ring counter

When the telephone rings, this register “counts-down” the number of rings remaining in register **S0**.

S2 Escape code value

This register holds the ASCII decimal value of the character used to command the modem to escape from the on-line state. You may assign any value from 0 to 127. The default value is 043 (“+”).

S3 Carriage return value

This register holds the ASCII decimal value of the character used to instruct the modem to execute a command. You may assign any value from 0 to 127. The default value is 013 (CONTROL-M).

S4 Line feed value

This register holds the ASCII decimal value of the line feed character. You may assign any value from 0 to 127. The default value is 010.

S5 Backspace value

This register holds the ASCII decimal value of the backspace character. You may assign any value from 0 to 32 or the value 127. The default value is 008.

Sx? Set Register interrogate command

This command causes the 3-digit number stored in the selected Set Register (x = register number, from 0 to 5) to be output to the screen.

TABLE FOUR RESULT CODES

Result codes are modem responses to your commands. A carriage return at the end of a command line causes the modem to execute the command. Upon completing the command, the modem will send a one or two word result code to your screen.

Result codes can be output as words or digits, or not sent at all, depending upon whether or not you've changed the default values of the **Q** or **V** commands. If these commands are in their default modes, result codes will be output as words. We recommend using words for clarity and ease of recognition unless your equipment or software doesn't handle character strings efficiently. If so, you have the option of having result codes output as digits.

Word Code: OK Digit Code: 0

Indicates that a command line has been executed without error.

Word Code: CONNECT Digit Code: 1

The modem has established a low speed data link, based upon detecting a low speed (110-300 bps) carrier signal from the remote modem.

Word Code: RING Digit Code: 2

The telephone line is ringing. The modem will answer the call only if given an **A** command, or if Set Register **S0** = 1 to 255.

Word Code: BUSY Digit Code: 3

The telephone number you dialed is busy.

Word Code: NO CARRIER Digit Code: 3

The modem has not detected a carrier signal or the carrier has been lost.

Word Code: ERROR Digit Code: 4

The modem was unable to execute a command for one of three reasons: 1) an error in the command line; 2) an invalid command (one not part of the command set); 3) the command line exceeds the 34 character buffer capacity.

Word Code: CONNECT 1200 Digit Code: 5

The modem has detected a high speed (1200 bps) carrier signal from the remote modem and established a data link.

Word Code: DIAL TONE Digit Code: none

The modem has detected a dial tone and is dialing the number.

Word Code: DIALING Digit Code: none

The modem has not detected a dial tone but is dialing the number anyway.

SECTION FIVE: BASIC OPERATING PROCEDURE

Before originating or answering a call, bear in mind that computers and modems are highly sensitive to outside interference during data communication. A bad connection can cause transmission errors. Interruptions from outside lines or extensions will end your transmission altogether. We suggest you use the following precautions:

1. If you have more than one telephone connected to a single line, advise everyone in your home or office not to lift an extension receiver off the hook while you're using the modem.

2. Avoid using telephones with a "call waiting" signal unless this feature can be switched off. Such signals will interrupt or end your data link.
3. If you find errors in the text you receive or transmit, test the quality of your connection by dialing manually and listening for static, echoes, low volume, etc. If the line is bad, ask your telephone operator to try for a better connection.

Automatic Dialing

Automatic dialing is performed under control of your computer or terminal. You don't need a telephone. The proper syntax for dialing is: Attention Code/Dial Command/Dial Type (optional)/Telephone Number (including commas for pauses and **T** or **P** for changes in dial type)/Optional ; if you wish to remain in the command state after dialing/<RETURN>. The example below shows how this would be input, along with the result codes.

Command: **ATD xxx , Tyyy Pzzzz RETURN**

Operational Result Code: **DIAL TONE** or **DIALING**

Connection Result Code: **CONNECT** or **CONNECT 1200**

All dial commands must begin with **AT** unless you are using **A/** to redial. In this example, **D** commands the modem to dial a number (xxx). Because the dial type was not specified, the modem will default to pulse dialing. The , causes a two second pause. **T** causes a switch to tone dialing. **P** causes a switch back to pulse dialing. The carriage return at the end of the command causes the modem to dial the number as instructed. Spaces were used for clarity, but are unnecessary and do take up space in the command buffer.

Upon detecting a dial tone, the modem will send the **DIAL TONE** result code to your screen. Upon connecting with a low speed modem, the Volksmodem will send the **CONNECT** result code to the screen. A high speed remote modem will cause the **CONNECT 1200** result code. The Volksmodem will automatically adjust to the transmission speed of the remote modem; however, your computer or terminal must be set to match the speed of the remote system.

If the number you called is busy, the modem will send the **BUSY** result code to your screen. To redial the number, type the command **A/**. There will be no operational result code as the modem redials the number. If the modem is successful at making a connection, it will send either **CONNECT** or **CONNECT 1200** to the screen, depending on the speed of the remote modem.

Automatic Answering

The Volksmodem 12 can be set to answer on a specified number of rings ($S0$ register = 1 to 255 rings), or not to answer at all ($S0 = 0$). The default is $S0 = 1$, which causes the modem to answer on the first ring. In the following example, the modem is instructed to answer on the third ring.

Command: **AT $S0 = 3$ (RETURN)**

Operational Result Code: **RING** (modem answers on specified ring)

Connection Result Code: **CONNECT** or **CONNECT 1200**

The modem is then on-line. The modem doesn't need a telephone in order to answer an incoming call, but a phone is useful if you wish to hear when the line is ringing.

To read the contents of register $S0$, enter:

Command: **AT $S0?$ (RETURN)**

Operational Result Code: **003** (or whatever number is stored in the register).

Note that after a software reset command (**AT Z**) register $S0$ defaults to **001**.

Manual Dialing

Manual dialing is most often used when you have trouble making a connection using automatic dialing. Manual dialing allows you to hear what's happening as you dial the number and wait for the carrier signal. The procedure is as follows:

1. Use your telephone to dial the remote system, just as you would a standard phone call.
2. When the remote modem answers, you'll hear its carrier signal. Immediately command your modem to seize the line by typing the command **AT D**, followed by a carriage return. If you are communicating with a low speed ($0-300$ bps) modem, the **CONNECT** result code will appear on your screen. If you're communicating with a high speed modem, you'll see the **CONNECT 1200** result code.
3. The modem is now on-line. Put your receiver back on the hook.

Manual Answering

When first switched on, or following a software reset command (**AT Z**), the modem will automatically answer an incoming call on the first ring. To answer the phone manually, you must disable the auto-answer function by setting register **S0** to **0** (Command: **AT S0 = 0**). You may then manually answer the telephone as follows:

1. When your telephone rings, lift the handset off the hook to answer. If the call is coming from another modem, you'll hear its carrier signal.
2. Command your modem to seize the line by entering the command **AT A**, followed by a carriage return. As with originating a call, you should see either the words "CONNECT" or "CONNECT 1200" as soon as the modem is on-line.
3. Hang up the phone.

Data Transfer

Once you've established a data link as indicated by a **CONNECT** or **CONNECT 1200** result code, you may transfer data between the Volksmodem 12 and the remote modem. When necessary, you may change operational states as follows:

1. To escape from the on-line state to the command state:

Command: (1 sec. pause) **+++** (1 sec. pause)

Operational result code: **OK**

The one second pauses before and after the escape command are used to separate it from other plus signs that may be output to your screen as data.

2. Execute the desired commands.
3. To return to the on-line state:

Command: **AT O (RETURN)**

Operational result code: **CONNECT** or **CONNECT 1200**

Disconnecting

The data link may be manually or automatically disconnected using the following methods:

1. **Command state disconnect** – Escape to the command state from the on-line state as previously described, and issue a hang-up command or reset command.

Hang-up Command Disconnect

Command: **AT H <RETURN>**

Result Code: **OK**

Reset Command Disconnect

Command: **AT Z <RETURN>**

Result Code: **OK**

2. **DTR Disconnect** – If the DTR switch on the back of the modem is in the ON position, the modem will disconnect (or not answer) if the DTR lead (pin 5) is in the low state.
3. **Automatic Disconnect** – The modem will automatically disconnect the line under the following conditions:
 - a. A lapse of 18 seconds with no signal activity after initial connection.
 - b. A loss of the on-line data carrier for 450 milliseconds.
4. **Telephone Line Disconnect** – Unplug the modular telephone cable from the modem line jack or wall outlet, then plug it back in.
5. **Power-off Disconnect** – Remove power from the modem by setting the modem POWER switch to OFF, or unplugging the 12V DC power adapter from the wall outlet, or unplugging the power adapter from the modem.

Methods 4 and 5 are considered a “brute force” approach and should be used only if the modem’s software commands have been disabled.

APPENDIX A: TROUBLESHOOTING/SERVICE INSTRUCTIONS

Symptom: HS Indicator doesn't light after power-up.

Solution:

1. Make sure the POWER Switch is set to ON.
2. Check the 12V DC Power Adapter connections.
3. Make sure your AC wall outlet is supplying current.

Symptom: HS Indicator Lights goes off after having been on.

Cause: Your computer or terminal is not sending data to the modem at 1200 bps.

Symptom: CD Indicator won't light.

Causes:

1. Poor telephone connection.
2. Weak carrier from remote modem.
3. Remote modem is incompatible with Volksmodem 12. Must be Bell 103 or Bell 212A compatible or equivalent.

Symptom: Incorrect data or garbled display

Causes:

1. Poor telephone connection.
2. Someone else using the telephone line.
3. Attendant telephone or extension phone with receiver off the hook.
4. Check communications protocol (transmission speed, parity, number of data bits and stop bits) and change if necessary.

Service










If you believe the modem itself is malfunctioning, disconnect it until the source of the problem is discovered. A malfunctioning modem may cause effects on public telephone lines outside the permissible operating specifications of FCC Part 68.

In the event of equipment failure, all repairs shall be performed by Anchor Automation, Inc. or by an authorized agent of Anchor Automation, Inc. It is the equipment user's responsibility to report the need for service.

Before returning any equipment, call 818-997-6493, ask for the Service Department, and report the problem or malfunction. Give the model number, type and serial number of the equipment. After receiving this information, we will provide you with the proper service instructions. Please do not return equipment without instructions from Anchor Automation.

APPENDIX B: VOLKSCABLE SELECTION GUIDE

Volkscable interconnect cables are packaged and sold by reference letter. In the chart below, cables are referenced to your computer or accessory card with serial port. Volkscable are supplied with a 6 ft. modular telephone cord.

	Manufacturer	Interface Description	Cable Type
	ACORN	ASYNCH SERIAL CARD (req'd)	A-12
	ALTOS	(direct)	A-12
	APPLE IIe, II+	ASYNCH SERIAL CARD (req'd)	A-12
	ALS	(IIe COMM CARD)	B-12
	CCS	(IIe COMM CARD)	B-12
	PURE DATA	(IIe COMM CARD)	B-12
	APRICORN	(IIe COMM CARD)	A-12
	IIc	(direct)	H
	MACINTOSH	(direct)	G
	LISA, III	(direct)	A-12
	ATARI	WITH AN 850 INTERFACE	C
		WITHOUT 850	n/a
		(300 Baud Software Incl'd)	F
	CANON	(direct)	A-12
	COLUMBIA MPC	(direct)	A-12
	COMMODORE 64	(300/1200 Baud Software Incl'd)	J
	COMPAQ	ASYNCH SERIAL CARD (req'd)	A-12
	CORONA	(direct)	A-12
	DEC RAINBOW	(direct)	D-12
	200, 300	(direct)	D-12
	EAGLE	(direct)	A-12
	EPSON QX-10	(direct)	A-12
	GENEVA	(direct)	A-12
	FRANKLIN 1000	ASYNCH SERIAL CARD (req'd)	A-12
	1200	(direct)	A-12
	FUJITSU	(direct)	A-12
	HEATHKIT	(direct)	D-12
	HEWLETT PACKARD	(direct)	A-12
	IBM PC, XT	ASYNCH SERIAL CARD (req'd)	D-12
	AT w/IBM Cable	(direct)	D-12
	PCjr w/IBM Cable	(direct)	D-12
	KAYPRO	(direct)	A-12
	NEC 8201	(direct)	A-12
	OSBORNE 1	(direct)	B-12
	EXECUTIVE 1	(direct)	A-12
	RADIO SHACK 1,2,3,4,16	(direct)	A-12
	COLOR COMPUTER	(direct)	E
	SANYO	ASYNCH COMM CARD (req'd)	A-12
	SONY	(direct)	A-12
	SPERRY	(direct)	A-12
	TELEVIDEO	(direct)	A-12
	TEXAS INST. 99/4A	ASYNCH COMM CARD (req'd)	B-12
	PC	ASYNCH COMM CARD (req'd)	A-12
	VECTOR 4 COMPUTER		B-12
	XEROX 820/820-2		A-12
	ZENITH	(direct)	A-12

APPENDIX C: COMMAND REFERENCE TABLES

OPERATING COMMANDS

AT	Precedes all commands	C0	Xmitter tone off
RETURN	Executes all commands	C1	Xmitter tone on
BACKSP	Deletes command characters	E0	No command echo
+++	On-line escape	E1	Command echo
O	On-line return	Q0	Sent result codes
A/	Last command repeat	Q1	No result codes
A	Answer immediate	V0	Digit result codes
I0	Identify	V1	Word result codes
I1	ROM test	F0	Half-duplex
H0	On hook	F1	Full-duplex
H1	Off hook	Z	Reset
D	Dial	,	Wait
T	Tone	P	Pulse
;	Command state return	Sx?	Read register x

RESULT CODES

Word	Digit	Description
OK	0	Command accomplished
CONNECT	1	Low speed carrier detected
RING	2	Telephone line is ringing
NO CARRIER	3	Carrier lost or none detected
BUSY	3	Phone number called is busy
ERROR	4	Command not accomplished
CONNECT 1200	5	High speed carrier detected
DIAL TONE		Dial tone detected
DIALING		Modem is dialing telephone

SET REGISTER COMMANDS

Register Description

S0	Number of rings to auto answer
S1	Counts number of rings
S2	Escape code character
S3	Carriage return character
S4	Line feed character
S5	Back space character

APPENDIX D: ASCII CHARACTER TABLE

DEC	HEX	CODE	DEC	HEX	CODE
0	00	NUL	42	2A	*
1	01	CTRL A	43	2B	+
2	02	CTRL B	44	2C	,
3	03	CTRL C	45	2D	-
4	04	CTRL D	46	2E	.
5	05	CTRL E	47	2F	/
6	06	CTRL F	48	30	0
7	07	CTRL G	49	31	1
8	08	CTRL H	50	32	2
9	09	CTRL I	51	33	3
10	0A	CTRL J	52	34	4
11	0B	CTRL K	53	35	5
12	0C	CTRL L	54	36	6
13	0D	CTRL M	55	37	7
14	0E	CTRL N	56	38	8
15	0F	CTRL O	57	39	9
16	10	CTRL P	58	3A	:
17	11	CTRL Q	59	3B	;
18	12	CTRL R	60	3C	<
19	13	CTRL S	61	3D	=
20	14	CTRL T	62	3E	>
21	15	CTRL U	63	3F	?
22	16	CTRL V	64	40	@
23	17	CTRL W	65	41	A
24	18	CTRL X	66	42	B
25	19	CTRL Y	67	43	C
26	1A	CTRL Z	68	44	D
27	1B	ESC	69	45	E
28	1C	FS	70	46	F
29	1D	GS	71	47	G
30	1E	RS	72	48	H
31	1F	US	73	49	I
32	20	SP	74	4A	J
33	21	!	75	4B	K
34	22	"	76	4C	L
35	23	#	77	4D	M
36	24	\$	78	4E	N
37	25	%	79	4F	O
38	26	&	80	50	P
39	27	'	81	51	Q
40	28	(	82	52	R
41	29	)	83	53	S

84	54	T	106	6A	j
85	55	U	107	6B	k
86	56	V	108	6C	l
87	57	W	109	6D	m
88	58	X	110	6E	n
89	59	Y	111	6F	o
90	5A	Z	112	70	p
91	5B	[	113	71	q
92	5C	\	114	72	r
93	5D	]	115	73	s
94	5E	A	116	74	t
95	5F	—	117	75	u
96	60	‘	118	76	v
97	61	a	119	77	w
98	62	b	120	78	x
99	63	c	121	79	y
100	64	d	122	7A	z
101	65	e	123	7B	{
102	66	f	124	7C	|
103	67	g	125	7D	}
104	68	h	126	7E	—
105	69	i	127	7F	DEL

APPENDIX E: SPECIFICATIONS

Operate Mode	Automatic ANS/ORIG selection, computer-controlled dial, computer-controlled answer, automatic speed mode selection
Line Interface	2-wire direct connect
Data Interface	RS-232C compatible
Duplex	Full
Transmit Carrier Level	-10dBm fixed
Carrier Detect Level	ON at -43 dBm Off at -45 dBm
Timers	
Answer quiet	2.5 sec.
Carrier fail disconnect	450ms
Answer abort disconnect	18 sec.
Originate abort disconnect	36 sec.

Low Speed Operation

Data format	Serial, binary, asynchronous
Data rate	0-300 bps
Modulation	FSK

Transmit Frequency	ORIG	ANS
MARK	1270 Hz	2225 Hz
SPACE	1070 Hz	2025 Hz

Receive Frequency	ORIG	ANS
	2225 Hz	1270 Hz
	2025 Hz	1070 Hz

High Speed Operation

Data Format	Serial, binary, character asynchronous
Modulation	PSK

Transmit frequencies	BAND	FREQ
	LO	1200 Hz
	HI	2400 Hz

Input data rate (DTE to modem)	1182 to 1212 bps
-----------------------------------	------------------

Line data rate (local to remote modem)	1200 bps (+/- 0.01%)
---	----------------------

Output data rate	1219 bps
------------------	----------

Data character length	10 bits
-----------------------	---------

Received frequency	+/- 7.0 Hz
--------------------	------------

Equalization type	Fixed compromise
Scramble polynomial	1 + (D-14) + (D-17)

Power requirement	12V DC, 150 mA, provided by supplied 115V AC power adapter
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Operating environment	0 to 50 degrees C (32 to 122.6 degrees F) 95% RH noncondensing
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Size	15.2cm x 23cm x 2.5cm (6.0 in. x 9.0 in. x 1.0 in.)
------	--

Weight	368gm (13 oz.)
--------	----------------

FIVE YEAR LIMITED WARRANTY

Anchor Automation, Inc. warrants equipment manufactured and sold by it to be free from defects in material and workmanship and to meet applicable specifications under normal use and service for a period of five (5) years after sale to the original owners. If any equipment or parts not covered by another manufacturer's warranty are deemed by Anchor Automation to have been defective originally, or if these parts or equipment are found to have become defective under normal usage rather than misuse, negligence or accident, Anchor Automation will repair or replace them without charge.

This warranty shall not apply to equipment or parts which are normally consumed in operation, nor to equipment which, in the opinion of Anchor Automation, has been repaired or altered outside the Anchor Automation plant in any way that would affect its reliability or stability. Also not covered is equipment subjected to misuse, negligence or accident, or which has been altered, defaced, or has had the serial number removed.

Anchor Automation, Inc. does not assume any liability for consequential damages and, in any event, the company's liability shall not exceed the purchase price.



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